

REMARKS

The Office Action dated November 28, 2006 has been received and carefully studied.

The Examiner rejects claims 1, 3 and 4 under 35 U.S.C. §102(b) as being anticipated by Kubota et al., WO 98/04598 (relying on its US equivalent, U.S. Patent No. 6,410,656). The Examiner states that Kubota discloses the preparation of polymer materials adhering to the structural description provided by the abstract, including the preparation of a thioester intermediate that is oxidized to furnish the sulfonic group.

By the accompanying amendment, the limitations of claim 2 have been incorporated into claim 1, and claim 2 has been cancelled. The claims are now limited to the process for the production of sulfomethyl-containing polymers (n=0). It is believed that the amendment overcomes the rejection.

The Examiner also rejects claims 1-7 under 35 U.S.C. §103(a) as being unpatentable over Koyama et al., U.S. Publ. No. 2005/0271922 in view of Kubota et al. The Examiner states that Koyama et al. disclose the preparation of aromatic polymer electrolytes bearing side chains adhering to the formula $(CH_2)_n-SO_3H$ wherein n is 1 to 6, and that any known sulfoalkylation method may be used. Kubota is cited for its disclosure of several synthetic strategies whereby a

haloalkyl substituent may be converted into a sulfoalkyl group.

The rejection is respectfully traversed.

Although Koyama discloses that any sulfoalkylation method can be employed to attach sulfoalkyl groups to aromatic hydrocarbon polymer and that another method involves the steps of substituting a hydrogen atom of an aromatic ring by lithium, substituting lithium by a halogenoalkyl group by dihalogenoalkane, and converting the halogenoalkyl group into a sulfoalkyl group, the other method specifically disclosed in the specification is only a method for the preparation of sulfomethylated poly-ether sulfone from halomethylated poly-ether sulfone by using sodium sulfate (see page 22, Embodiment 14). Koyama does not disclose or suggest the present method for the preparation of sulfomethylated polymer from halomethylated polymer through acylthiomethylated polymer.

Submitted here with is a Declaration by Mr. Masahiro Hamada, one of the inventors of the present invention. In the Hamada Declaration, experiments were carried out to obtain products prepared by the method disclosed in Embodiment 14(2) of Koyama, and the results are reported in the Declaration. The results show that the ion-exchange capacity of the compounds obtained by the method of

Experiment 14(2) of Koyama was only 0.03 mmol/g, which is equal to 29400 g/mol, though Koyama discloses that an ion-exchange capacity of the products of Embodiment 14 was 600 g/mol (see paragraph [0261], lines 1-3 from the bottom).

The obtained ion-exchange capacity of 0.03 mmol/g is very low in comparison to the capacity of the present invention of 1.29 meq/g (see Example 2 of the present specification). The results shown in the Declaration are in accordance with the result of Comparative Example 3 using sodium sulfate in the present application, although there are differences in the amount of sodium sulfate and reaction conditions such as reaction temperature and reaction times. That is, the substitution of chlorine atoms of chloromethylated poly-ether sulfone with sulfo groups was carried out by using sodium sulfate in Comparative Example 3 of the present application, and the result was that the chloromethyl group had scarcely been reacted and the ion-exchange performance was barely detected. This confirms that the results of the experiment in the Declaration are correct.

As mentioned above, the method for preparation of sulfomethylated polymer from halomethylated polymer through acylthiomethylated polymer of the amended claim 1 is an excellent method for the preparation of sulfomethylated

polymer compared to Koyama's method using sodium sulfate for substitution of a chlorine atom in a halomethylated polymer into a sulfo group.

Kubota discloses several synthetic strategies whereby a halo C3-C8 alkyl substituent may be converted into a sulfo C3-C8 alkyl group by reaction of the halo C3-C8 alkyl-substituted polymer with CH₃COSH followed by oxidation. The Examiner asserts that Kubota has disclosed that an acylthio group is used for the introduction of a sulfonic group and further a sulfoalkyl group. However, Kubota discloses only a method for preparing a polymer having a sulfo C3-C8 alkyl group as one of the synthetic strategies and does not specifically disclose it as a synthesis example. Furthermore, Kubota's polymer having a sulfo C3-C8 alkyl group on the benzene ring does not include a sulfomethylated polymer as in the present invention. Accordingly, Kubota does not disclose or suggest that the present method for the preparation of sulfomethylated polymer from halomethylated polymer through acylthiomethylated polymer is an excellent method compared to Koyama's method using sodium sulfate for substitution of a chlorine atom in a halomethylated polymer into a sulfo group.

Concerning claims 2, 6 and 7, the Examiner asserts that Koyama expressly discloses the embodiment wherein the

sulfate and, hence, the acylthioprecursor, is bonded to the aromatic ring via a methyl group. However, as mentioned above, Koyama discloses only a method for the preparation of sulfomethylated poly-ether sulfone from halomethylated poly-ether sulfone by using sodium sulfate (see page 22, Embodiment 14), and Kubota discloses only a method for preparing a polymer having a sulfo C3-C8 alkyl group as one of the synthetic strategies and does not specifically disclose it as a synthesis example, and furthermore, Kubota's polymer having a sulfo C3-C8 alkyl group on the benzene ring does not include a sulfomethylated polymer as in the present invention. Koyama does not disclose or suggest the embodiment wherein the sulfate, and hence the acylthioprecursor, is bonded to the aromatic ring via a methyl group.

Certain claims have been amended to eliminate improper multiple dependencies.

Reconsideration and allowance are respectfully requested in view of the foregoing.

Respectfully submitted,


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